Vol. 37 No 8

BULLETIN

OF THE

TORREY BOTANICAL CLUB

AUGUST, 1910

Have we enough New England blackberries?

EUGENE P. BICKNELL

What are we to believe about our wild blackberries? Has nature bestowed on our flora really many more than those few well-accredited species which have come down to us from our botanical forefathers, or are our woods and fields crowded with the brave number which recent years have spread on the botanical page and which, by the token of their array, may yet be infinitely multiplied?

Our wise forefathers in the restraint of their learning were cautious in their treatment of this suspiciously unconventional group of plants—too cautious, it may be, and perhaps not so wisely restrained after all. Quite possibly their example of conservatism carried its influence too securely into the widened outlook of the present day and some form of reaction was predestined to follow in the accounting. Be this as it may, the spell has finally been broken, and lo,—the fragments!

What is the blackberry situation at this hour? It is indeed an unhappy heritage. Where angels had feared to tread the ground has been traversed, and so unforbearingly, notwithstanding the briers, that not any semblance of a pathway has been suffered to exist.

My study of the flora of Nantucket in course of publication has led me, reluctant, into the general blackberry problem. No evasion was possible. Many unusual forms of blackberries are found on Nantucket and, in order to discuss them at all, it was necessary first to determine whether any or all of them had been

[The BULLETIN for July, 1910 (37: 345–392) was issued 29 Jl 1910.]

accounted for in recent print. If the study of what had thus been offered should fall into no final Rafinesquian entanglement, there was the hope that it might unfold some long concealed but consistent and beautiful multiple structure of evolution's handiwork. And if, peradventure, there should be disclosed any sad mixture of dislocated facts and naïve fancies, then those unwisely conservative botanical forefathers should be held to their proper blame. In any case, the problem required some attempt at solution. Hence these lines.

Two fundamental facts about our blackberries should not long escape the most casual student. Even the least unstable species possess some kind of ready pliancy, which answers, often with marked emphasis, to slightly changed conditions of growth; and, further, all the species by some freely practised method of versatility acquire variously in combination with their own proper characters the features of associated members of their group. These facts import an extraordinary natural variability and undoubtedly, also, a facility in hybridizing which is perhaps not exceeded in any other genus of our flora.

A number of years ago, before these facts were well apprehended, the blackberries of York County, Maine, excited my wonder and engaged my particular attention. Who knows but that for a warning sounded by President Brainerd the observer of those days might have complacently occupied the pitfall which thus invited any artless and too self-assured purveyor of spurious species? President Brainerd's admonition, which was not unduly apprehensive, as later events have shown, may well be quoted here: "Our American blackberry is so excessively variable that in order to be completely understood it may in time need to be presented under as many mental types. But we most sincerely hope that only experts—after years of study—will attempt it."*

Since the day of that admonition, York County, Maine, has become distinguished as a stronghold of blackberry trouble. Here a Canadian flora is thrown out along a partly deforested country fronting the ocean shore, which has also received a counter-invasion of the coastwise flora of more southern New England. The condition of compression within this coastal strip may well

*Rhodora 2: 23, 24. F 1900.

be supposed to produce a tension between two distinct floras not usually brought into contact, and to place many plants in unaccustomed relations of contiguity. Among plants capable of hybridizing such conditions could scarcely fail to give the opportunity.

The intricate taxonomic problem presented by our blackberries has long been to the writer a most fascinating subject of attention, but without the opportunity of adequate study, and the conclusions which the present situation in the group has here called prematurely into expression are advanced with many reservations.

Something like fifty new blackberry names have been added to the lists during recent years. Of these the majority, some forty or more, have been promulgated by Mr. W. H. Blanchard from the general New England region. Full sets of specimens bearing these new names have been distributed. They have been well collected and better herbarium material need not be desired. Those deposited in the herbarium of the New York Botanical Garden have been utilized in the present study.

It would scarcely yet be the part of wisdom to accept any one of these new names as denoting a valid species nor, on the other hand, is there sufficient warrant in our present knowledge for reporting all of them as being without standing. I should suppose, however, that some sixty per cent. of the number might be allowed to pass into the category of synonyms; the remainder, possibly with a few exceptions, appear to disclose themselves as scarcely doubtful hybrids. It should be said at once, however, that no sufficient proof, properly so considered, can be adduced in support of this view. But every reasonable probability of circumstantial evidence points to such a conclusion; it seems to meet the requirements of a correct working hypothesis among the multitude of interrelated forms which the group presents and to satisfy various theoretical tests. Nevertheless, in so general a commitment of alleged new species it is more than possible that mistakes have been made and that there may be some members of wholly unblemished origin which should be rescued from the asylum of bastards.

As to the valid New England blackberries I see little reason to doubt that we have at least eleven species in the *Eubatus* group, here alone considered, as follows:

Rubus allegheniensis Porter.
argutus Link.
canadensis L.
cuneifolius Pursh.
frondosus Bigelow.
nigricans Rydb.
hispidus L.
procumbens Muhl.
Baileyanus Britton.
Enslenii Trat.
flagellaris Willd.

Under these names, if I have not wholly misconceived the problem, all or nearly all more recent names may be disposed somewhat in accordance with the arrangement in the following tables. The problem is made very intricate by reason of the extreme variability of the apparent hybrids, which would appear to have acquired a compound tendency to variation through their double inheritance. And there are indications that compound hybrids have also to be reckoned with. What appear to be the product of the same crosses present themselves under many different aspects according as they resemble one or the other parent or variously combine the characters of both. And the crosses appear to reflect also the fluctuating forms of development to which the parents are subject under varied conditions of growth and in different parts of their range. So freely do our species appear to hybridize that there would seem to be little reason to doubt that every one of them holds the capability of crossing with every other one. There is thus among the species here enumerated, omitting *Rubus cuneifolius*, only a local plant in New England, a potentiality of forty-five primary hybrids, and nearly all of this possible number appear to be accounted for by existing forms. Some of these seem to announce their parentage quite unmistakably, while others offer mere suggestions only, easily misinterpreted, of what their origin may be. The final word is not for the systematist but for the experimental culturist and must rest on the demonstration which induced crossing can alone supply.

Not all of the species here taken to be valid are secure against the test, having its advocates, that species may not intergrade.

It would need a very keen botanical eye to discover inviolable boundary lines separating *Rubus allegheniensis* from *Rubus canadensis* on the one hand and from *Rubus argutus* on the other; and between *Rubus argutus* and *Rubus frondosus* there exists a range of forms equally open to a double claim. Among the trailing species the lines of separation are even less effectively protected.

There would thus appear to be little room for new species in this group. Its units are established at such narrow intervals that the organic circumference of each undoubtedly invades that of one or more of the others. In many another genus of plants wherein the species move within a more contracted radius, differences far less pronounced than those which mark mere forms or states of our *Rubi* might be evidence enough of distinct organic type. The genus *Rubus*, however, would appear to represent the growing point of a genetic phylum subject to great variational activity and rapid and impermanent change and, not least to be considered, ready hybridization. In this view even wide variations in these plants are to be understood as the expression of a concentrated phylogenetic energy rather than as evidence of a completed organic segregation.

All of our species, however, show regional and local variations which, if unstable, are more or less obvious. For those who enjoy the exploitation of varieties here is a pristine field where their name is legion. For myself I have never yet been able to comprehend by what theory of differentiation the infinite varieties of plants are cast into two main categories—the to be named and the to be nameless. Not less among the blackberries than in many another group the accustomed eye finds varieties well marked for it everywhere, and moves freely out beyond the range of charted taxonomy not to be overtaken by any strained following of printed names. Shall we dare to hope, notwithstanding, that the foundations builded for this group by our forefathers may not ever be weighted by some crataegal structure which it is ill fitted to support? It has perhaps been thought that the genus *Rubus* was subject to an interpretation similar to that which has been unfolded in the genus *Crataegus*. To my observation there is an unmistakable failure of parallel between the composed and resistent, if often slight, differences between the species of *Crataegus* and the often

strongly expressed but weakly held variations scattered broadcast among the forms of *Rubus*.

My own study of this group, inadequate though it has been as a basis for assured conclusions, has led me notwithstanding, to make one addition to the number of our species. No need arises, however, for adding a new name to an already overburdened genus, for it seems possible with reasonable certainty to correlate this plant with the *Rubus flagellaris* of Willdenow, a trailing species allied to *Rubus procumbens*, which appears never to have been interpreted. This plant, which occurs on Nantucket and on Long Island, seems to possess the individuality of a true species and I have not been able to see how it can be accounted for as a hybrid. Furthermore it seems to be required as a parent of a series of Nantucket hybrids otherwise difficult or impossible to understand. This plant will be discussed in detail in another connection.

It is more than probable that some other species of eastern blackberries than those here accepted may yet come to light. In different parts of their ranges there is to be observed a perturbation among some of our hybrid forms which would seem to indicate either the influence of some unrecognized unit of species quality or else a process of intercrossing among primary hybrids very difficult to elucidate.

The wide fluctuations in the characters of all our blackberries under differing environments does not wholly obscure the fact that these variations in many cases take recognizable directions. It will doubtless ultimately be possible to define such tendencies with some approach to systematic form but, to use again the words of President Brainerd, it is to be hoped "that only experts—after years of study—will attempt it."

Specimens representing all the hybrids here proposed which have not already been described in detail as species will be deposited in the herbarium of the New York Botanical Garden. And it is intended that descriptions shall follow as opportunity may allow.

Current practice seems to require that the names of hybrid plants should bear the authority of the author by whom they were first proposed. It may be questioned whether by this usage the citation of an author's name is not a little overstrained. Unlike the case of a true species, the precise relationship and identity of a

hybrid plant is verifiable by experimental proof. Its name, formed from the combined names of its parents, comes into being automatically with the birth of the hybrid itself. It is not the creation of any author. And it may well be asked why its already compound structure should be further burdened with the name of an author by whom a certain one, possibly of many, forms of the hybrid was first made known.

No reason appears for instance why the author of the present paper should be cited as authority for the names of crosses which it becomes necessary here first to employ. Nevertheless, in order more certainly to divest the subject from all nomenclatorial claims in these pages and to allow the free treatment of a tabular presentation, I wish to be understood merely as pointing out the probability of the occurrence of the hybrids mentioned, not as announcing that they are known unmistakably to exist.

RUBUS CANADENSIS L.

R. elegantulus Bld.

R. amabilis Bld.

× ALLEGHENIENSIS: *R. ovarius* Bld. and *R. pergratus* Bld. so unite characters of *R. canadensis* and *R. allegheniensis* that a presumption of hybrid origin from those species seems unavoidable.

× NIGRICANS: *R. peculiaris* Bld. appears to belong here.

× HISPIDUS: *R. multiformis* Bld. may well be a form of this cross. Certain specimens of *R. vermontanus* Bld. are not to be separated from *R. multiformis*.

× BAILEYANUS: The characters of *R. recurvicaulis* Bld. would appear to point to its origin in the parentage here suggested.

× PROCUMBENS: *R. recurvicaulis*, var. *inarmatus* Bld., and *R. multiformis*, var. *delicatior* Bld., should be studied in the field with reference to their probable relationship with *R. canadensis* on the one hand and *R. procumbens* and *R. Enslenii* on the other.

In regard to *Rubus Randii* (Bailey) Rydb. there seems to be good reason to suppose that it is either a reduced form of *R. canadensis* or a hybrid of that species. I have not seen the type specimens but, judging from current labeling of botanical sheets, there would seem to be no definite conception among collectors of just

what the supposed species is or should be expected to be, and weak forms of a number of different blackberries have been referred to it. Among specimens so determined, spindling forms of *R. canadensis* are clearly to be recognized, and I have seen a few specimens of aberrant plants which actually suggested a cross between *R. canadensis* and *R. triflorus* Rich.

RUBUS ALLEGHENIENSIS Porter.

R. glandicaulis Bld.

× CANADENSIS: See under *R. canadensis*.

× ARGUTUS: Nantucket; Long Island.

× FRONDOSUS: Nantucket; Long Island.

× NIGRICANS: *R. frondisentis* Bld.

× HISPIDUS: *R. permixtus* Bld. *R. flavinanus* Bld. is perhaps a form of this cross or possibly a compound hybrid involving *R. nigricans*, *i. e.*, *R. allegheniensis* × *vermontanus*.

× PROCUMBENS: Long Island.

× ENSLENII: *R. invisus* Bailey is possibly to be explained as a hybrid of these species. Certain herbarium specimens, presumably authentic, readily allow the suggestion, but, never having seen the living plant, I may altogether misunderstand it.

× BAILEYANUS: Long Island. *R. Jeckylanus* Bld. I think may be referred here.

Rubus sativus Brainerd, a name for which, I believe, President Brainerd through some misadventure of editor or printer was unintendedly on his part made to stand sponsor, represents a plant which I am inclined to regard as a weakened shade form of *R. allegheniensis* or perhaps some mixture of that species and *R. Baileyanus*.

RUBUS ARGUTUS Link.

R. floricomus Bld.

R. Andrewsianus Bld.

R. amnicolus Bld.

× ALLEGHENIENSIS: Nantucket; Long Island.

× FRONDOSUS: Nantucket; Long Island.

× NIGRICANS: *R. ascendens* Bld., in part. Nantucket; Long Island.

× HISPIDUS: Long Island.

× PROCUMBENS: Nantucket; Long Island.
× BAILEYANUS: Long Island.
× ENSLENII: Long Island.
× FLAGELLARIS: Nantucket.
× CUNEIFOLIUS: A plant collected at Tom's River, New Jersey, July 1, 1900, has every appearances of being this cross.

Rubus amnicolus, here placed with *R. argutus*, represents one of those intermediate variants between *R. allegheniensis* and *R. argutus* which, with equal reason, might be regarded as a form of either species. When copiously glandular their relationship to *R. allegheniensis* would scarcely be doubted; when glandless or nearly so they are not to be separated from racemose forms of *R. argutus*.

RUBUS FRONDOSUS Bigel.

R. recurvans Bld.
R. recurvans, var. *subrecurvans* Bld.
R. arundelanus Bld.
R. Rossbergianus Bld.
R. philadelphicus Bld.
× ALLEGHENIENSIS: Nantucket; Long Island.
× ARGUTUS: Nantucket; Long Island.
× NIGRICANS: *R. abbrevians* Bld. Nantucket; Long Island.
× HISPIDUS: Nantucket.
× PROCUMBENS: *R. multispinus* Bld. Nantucket; Long Island.
× BAILEYANUS: Nantucket; Long Island. *R. arenicolus* Bld. is very close to this hybrid.
× ENSLENII: Long Island.
× FLAGELLARIS: Nantucket.

RUBUS NIGRICANS Rydb.

R. vermontanus, var. *viridifolius* Bld.
R. jacens Bld.
R. tardatus Bld.
R. junceus Bld.
R. Groutianus Bld.
R. semisetosus Bld.
× CANADENSIS: *R. peculiaris* Bld.
× ALLEGHENIENSIS: *R. frondisentis* Bld.

× ARGUTUS: *R. ascendens* Bld., in part. Nantucket; Long Island.

× FRONDOSUS: *R. abbrevians* Bld. Nantucket; Long Island.

×HISPIDUS: *R. setosus* Bigel.; *R. vermontanus* Bld., in part; *R. trifrons* Bld.; *R. cubitans* Bld.; *R. hispidus*, var. *major* Bld. The plants described under these names are more or less intermediate between *R. nigricans* and *R. hispidus* and make up a group of connected forms showing the interplay among them of the same characters in slightly different combinations. *R. vermontanus* approaches very close to forms of *R. hispidus* × *procumbens*.

× PROCUMBENS: *R. semierectus* Bld. Long Island. *R. plicatifolius* Bld., although very dissimilar to *R. semierectus*, I am inclined to regard as a form of the same cross, perhaps a semi-pathological state.

× BAILEYANUS: Long Island.

× ENSLENII: Long Island.

× FLAGELLARIS: Nantucket.

RUBUS HISPIDUS L.

× CANADENSIS: *R. multiformis* Bld.

× ALLEGHENIENSIS: *R. permixtus* Bld.

× ARGUTUS: Long Island.

× FRONDOSUS: Nantucket.

× NIGRICANS: See under *R. nigricans*.

× PROCUMBENS: Nantucket.

× BAILEYANUS: Long Island.

× ENSLENII: Long Island.

× FLAGELLARIS: Nantucket.

RUBUS PROCUMBENS Muhl.

× CANADENSIS: See under *R. canadensis*.

× ALLEGHENIENSIS: Nantucket; Long Island.

× ARGUTUS: Nantucket; Long Island.

× FRONDOSUS: *R. multispinus* Bld. Nantucket; Long Island.

× NIGRICANS: *R. semierectus* Bld. *R. plicatifolius* Bld. Long Island.

× HISPIDUS: Nantucket.

× BAILEYANUS: *R. roribaccus* Bailey, which I find almost always associated with *R. procumbens* and *R. Baileyanus*,

appears to show no characters not derivable from one or the other of these species.

× ENSLENII: *R. geophilus* Bld., in part. Nantucket; Long Island.

× FLAGELLARIS: Nantucket.

RUBUS BAILEYANUS Britton.

× ALLEGHENIENSIS: *R. Jeckylanus* Bld. Long Island.

× ARGUTUS: Long Island.

× FRONDOSUS: *R. arenicolus* Bld. Nantucket; Long Island.

× NIGRICANS: Long Island.

× HISPIDUS: Long Island.

× PROCUMBENS: See under *R. procumbens*.

× ENSLENII: Nantucket; Long Island. *R. geophilus* Bld., in part.

× FLAGELLARIS: Nantucket.

RUBUS ENSLENII Trat.

R. subuniflorus Rydb., in part.

R. geophilus Bld., in part.

× ALLEGHENIENSIS: See under *R. allegheniensis*.

× ARGUTUS: Long Island.

× FRONDOSUS: Long Island.

× NIGRICANS: Long Island.

× HISPIDUS: Long Island.

× PROCUMBENS: *R. geophilus* Bld. in part. Nantucket; Long Island.

× BAILEYANUS: Nantucket; Long Island.

× FLAGELLARIS: Nantucket.

RUBUS FLAGELLARIS Willd.

× ARGUTUS: Nantucket.

× FRONDOSUS: Nantucket.

× HISPIDUS: Nantucket.

× PROCUMBENS: Nantucket.

× BAILEYANUS: Nantucket.

× ENSLENII: Nantucket.

NEW YORK CITY.

A quantitative study of the more conspicuous vegetation of certain natural subdivisions of the coastal plain, as observed in traveling from Georgia to New York in July

ROLAND M. HARPER

In July, 1906, I made a zigzag journey from Georgia northeastward through the coastal plain, and after the botanical notes resulting therefrom had been digested so as to bring all the records of each species together, I prepared from them lists of plants which seemed to be common in all the states studied, and of some which were evidently more common in one state or region than in others, and also pointed out certain peculiarities of distribution of individual species. In the published account of this trip* some attention was paid also to general geographical features, aspects of vegetation, and plant habitats, but I did not do much in the way of defining natural geographical regions within the coastal plain, as the relations between vegetation and geology were not so evident in the Carolinas as in the states farther west.

Three years later I went through the coastal plain of the same states in the same direction, but by as different a route as possible, and afterward, instead of grouping my notes by species as before, I tried to determine the boundaries of the minor vegetation provinces that I had passed through, and then made a rough quantitative study † of the vegetation—or rather as much of it as could be identified from the car window—of each province.

On this second trip I started northward from Savannah on the afternoon of July 26, 1909, crossed the Savannah River into South Carolina about 33 miles out, and struck the fall-line at Columbia, about 140 miles due north of my starting-point. Remaining on the same train, I was then carried northeastward along or near the fall-line 106 miles, to Hamlet, North Carolina, but missed the last

*Bull. Torrey Club **34**: 351–377. 1907.

†Most studies of vegetation in the past have been of an essentially qualitative nature, but quantitative work ought to be just as useful in phytogeography as it is in chemistry.

forty or fifty miles of scenery on account of darkness. From Hamlet early the next morning I walked back along the same route about a mile in order to study the sand-hill vegetation at close range. A little later I took the train for Wilmington, North Carolina's principal seaport, 110 miles away,* and after about an hour's wait there proceeded northeastward to New Bern,† 86 miles farther. On the twenty-eighth I went by the Norfolk & Southern Ry. up to Norfolk, Virginia, about 162 miles. The next day I went by the C. & O. Ry. from Newport News (just across Hampton Roads from Norfolk) to Richmond, 75 miles, and Doswell, 27 miles farther, then took the direct route to Washington. (Darkness came on about the time I reached the banks of the Potomac at Quantico, Va., the northern terminus of the R. F. & P. R. R.) On the afternoon of the thirtieth I went from Washington to Philadelphia by the Pennsylvania R. R., but without taking any notes, partly because the vegetation along that part of the route has been too much tampered with, and partly because it had been seen by so many botanists before. On the morning of the thirty-first I crossed the ferry to Camden, N. J., and went by rail directly east to the coast. Finally, after spending three days in the vicinity of Belmar and Tom's River with Dr. J. W. Harshberger, I went on to New York, through a thickly settled region in which no botanical notes of importance were obtained.

The route above described crossed that of 1906 at Fairfax, S. C., and Wilmington, N. C., and was tangent to it at Norfolk and Richmond. Except in the vicinity of these places the two routes were so far apart that in the present state of my knowledge of the geography of the Carolinas and Virginia I do not like to attempt much correlation between them; but in three of the regional lists below I have made use of my 1906 notes, in a manner to be explained.

*I traversed the first 32 miles of this, from Hamlet to Pembroke, in November, 1905, partly on foot. (See Torreya **6**: 41–45. 1906). Although less than four years had elapsed, I could see that quite a number of changes had taken place along that part of the route. The population must have increased at least 10 per cent., and the natural vegetation suffered proportionately.

†The post-office authorities and some of the railroads print this name "Newbern," but the inhabitants of the city still prefer "New Bern," as attested by signs, legal documents, etc., and there does not seem to be any sufficient reason for disregarding their usage in the matter at present, although the simpler form may ultimately prevail.

In the following crude sketches of the regions passed through, the plants which I was able to identify in each are divided into trees, shrubs, and herbs, in my accustomed manner, and to each is prefixed the number of times it was noted from the train, with this modification: namely, wherever a species was very abundant (and so indicated in my field notes) I have counted it twice, just

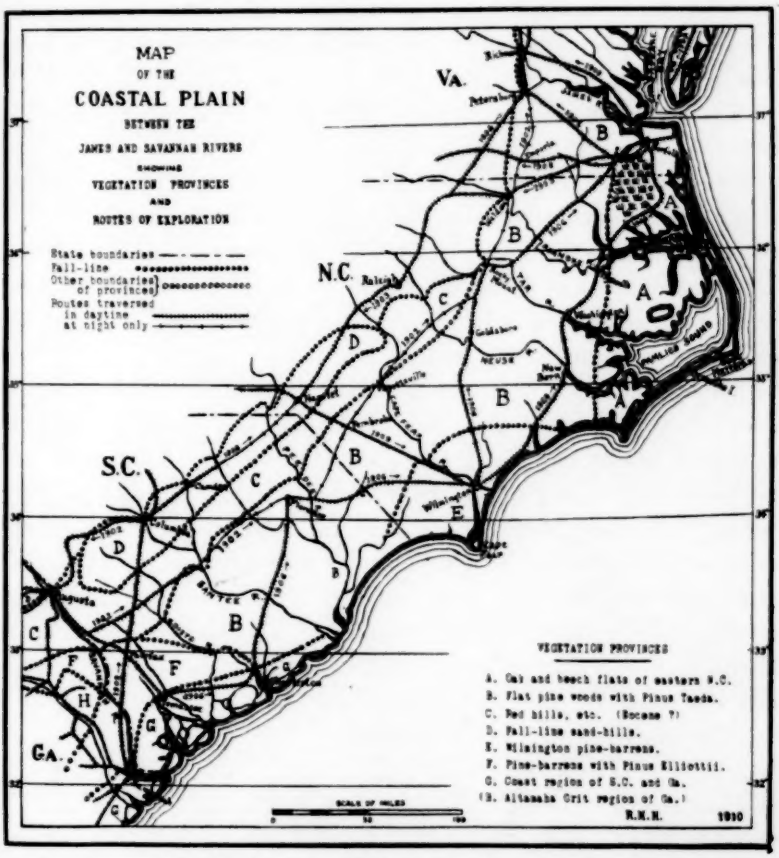

FIGURE 1. Map showing some of the vegetation provinces described herein, and the author's travels in the coastal plain between Virginia and Georgia from 1900 to 1909. Compiled from car-window notes and the maps of Kerr, Hammond, and others.

as if I had noted it twice between two consecutive mile-posts (as I might easily have done if I had been on a slower train). Species noted only once in a distance of 75 miles or less, or not more than twice in a distance of over 75 miles, are omitted.

As each list of course combines several habitats, I have not attempted to distinguish evergreens, vines, etc., as I sometimes do in treating habitat lists, but I have placed the names of weeds in parentheses, so as to make a little distinction between natural and unnatural vegetation. It is so difficult to estimate the effects of civilization on the relative abundance of native plants that I have left that phase of the problem almost untouched in this paper. Probably the most marked effect is the growing scarcity of long-leaf pine.

In my earlier paper already cited I referred to 68 works by other authors which bore more or less directly on the phytogeography of the Carolina and Virginia coastal plain. Not much additional literature of that kind has appeared since, except a few more of the soil surveys of the U. S. Department of Agriculture. Under each region described I will mention a few of the more important references to it in previous publications, as I did not classify the literature by regions before.

That part of my route north of Savannah which lay in Georgia I had traversed once before (in June, 1903), but had never written anything about it. As I excluded it from the Altamaha Grit region in both of my published maps of Georgia* (though perhaps without sufficient reason) a superficial description of it will not be out of place here. It is mostly flat pine-barrens, with frequent gum swamps, and not many ponds. Only a small proportion of the area is under cultivation, but lumbering has greatly reduced the amount of *Pinus palustris*, as has been the case nearly throughout the range of that useful tree.

The plants noted are as follows:

TREES.

13 *Pinus serotina*
13 *Nyssa biflora*
11 *Pinus palustris*
10 *Pinus Elliottii*
9 *Liquidambar Styraciflua*
5 *Pinus Taeda*
4 *Magnolia glauca*
4 *Acer rubrum*
3 *Taxodium imbricarium*
2 *Liriodendron Tulipifera*
2 *Quercus falcata*

SHRUBS.

7 *Serenoa serrulata*
6 *Clethra alnifolia*
4 *Cliftonia monophylla*
4 *Quercus pumila*

*The frontispieces of Ann. N. Y. Acad. Sci., vol. 17, no. 1, 1906, and Southern Woodlands, vol. 1, no. 3, 1907.

6 *Myrica cerifera*
4 *Smilax laurifolia*
3 *Hypericum aspalathoides ?*
2 *Ilex glabra*

HERBS.

18 *Eupatorium rotundifolium*
7 *Tillandsia usneoides*
6 *Eriocaulon decangulare*
3 *Pluchea imbricata*
3 *Osmunda cinnamomea*
2 *Campulosus aromaticus*
2 *Rhexia Alifanus*
2 *Scirpus Eriophorum*
2 *Hibiscus aculeatus.*

(The flat pine-barrens of the southeastern part of the Altamaha Grit region, between Valdosta and Walthourville, Georgia, which I had studied in the same way a few days before, seem to have *Pinus Elliottii*, *Taxodium imbricarium*, *Ilex glabra*, and *Rhexia Alifanus* relatively more abundant, and *Pinus serotina*, *Eupatorium rotundifolium*, *Liquidambar*, *Pinus Taeda*, *Tillandsia*, and *Osmunda cinnamomea* perceptibly less so.)

Of the plants listed above, *Serenoa* and *Cliftonia* were not seen any more after leaving Georgia, this being just about the northern limit of both.

After crossing the Savannah River the railroad goes for about five miles through bottom-lands, in which *Liquidambar* and *Pinus Taeda* are the commonest trees and *Tillandsia usneoides* almost the only herb recognizable from the train. (It is hardly worth while to make a formal list of the plants seen in the ten or fifteen minutes it took to pass through these bottoms.)

The "rolling wire-grass country" of the Altamaha Grit region, which separates the lime-sink region from the flat pine-barrens all the way across Georgia, seems to terminate at or near the Savannah River, and the country just east of there in South Carolina appears to combine to a considerable extent the characters of those two regions which are so widely separated in Georgia and Florida. This part of South Carolina is a part of Hammond's "lower pine belt."* Its peculiarities are not easily pointed out, but it may be briefly described as a region of flat or nearly flat grassy pine-barrens with very little underbrush, and many shallow ponds. Its soil is probably a little more fertile than that of some other pine-barren regions, for there are more cultivated fields along this part of the route than I saw in the same distance south of the Savannah River.

*"South Carolina" 44–56. 1883; Tenth Census U. S. **6**: 478–481. 1884.

In 1906 I passed through this region for a distance of 35 miles, between Allendale and Yemassee, and in 1909 I traversed it from about Garnett to Sycamore, a distance of some 28 miles; the two routes crossing at Fairfax, near its upper edge. In the following table the notes of the two trips are combined, but the figures are kept distinct, those for 1906 being given first in each case. As the dates were almost exactly the same in the two years there is no appreciable seasonal difference to be allowed for. The 1906 figures average somewhat smaller in this and the two other tables similarly constructed, probably because I did not watch the mile-posts as closely then as I did in 1909.

		TREES	
5+15	*Pinus Elliottii*	3+3	*Pinus Taeda*
8+10	*Taxodium imbricarium*	5+0	*Magnolia glauca*
9+4	*Pinus serotina*	1+2	*Liquidambar Styraciflua*
4+8	*Nyssa biflora*	1+2	*Quercus marylandica*
7+1	*Pinus palustris*	2+1	*Acer rubrum*
2+4	*Liriodendron Tulipifera*		
		SHRUBS	
8+6	*Clethra alnifolia*	0+2	(*Prunus angustifolia*)
		HERBS.	
1+12	*Eriocaulon decangulare*	0+3	*Pluchea bifrons*
1+10	*Eupatorium rotundifolium*	1+2	*Pontederia cordata*
3+8	*Oxypolis filiformis*	1+2	*Lespedeza capitata sericea*
4+6	*Polygala cymosa*	0+2	*Ludwigia pilosa*
2+4	*Zygadenus glaberrimus*	0+2	*Rhexia Alifanus*
3+2	*Tillandsia usneoides*	0+2	*Sabbatia decandra*
5+0	*Sarracenia flava*	1+1	*Osmunda cinnamomea*
2+2	*Anchistea virginica*	1+1	*Polygala ramosa*
0+4	*Scirpus Eriophorum*		

If I could have made this trip fifteen or twenty years earlier, when the railroad (then known as the South Bound R. R.) was new, *Pinus palustris* would doubtless have headed my list. Its present inferior rank here is due partly to lumbering operations, and partly to the fact that it occupied the driest soils, which were best suited to cultivation, while the trees that stand ahead of it in the above list all prefer wet places and have thus escaped destruction to a much greater extent.

Pinus Elliottii, *Pluchea bifrons*, *Ludwigia pilosa*, and *Sabbatia decandra*, all of which are typical, pine-barren pond plants, were not seen again after leaving Barnwell County, ponds being very

rare in the coastal plain farther north. A few of the other species seem to be more abundant in South Carolina than in any state farther north, probably for the same reason, as I have previously pointed out.*

The next 44 miles, from about the Salkehatchie River to the North Fork of the Edisto, were through a more hilly, less sandy, and more cultivated region, a continuation of the Eocene region of Georgia. In 1906 I passed through the same region for a similar distance in Aiken and Barnwell counties, between the Savannah River and Allendale. This part of South Carolina was included by Governor Drayton† in the "middle country," and described by Hammond‡ as the "upper pine belt" and "red hills." According to Hammond, in 1880 about 30 per cent. of the region was under cultivation, and over one third of that in cotton. (The proportion of cultivated land at the present time is probably at least 50 per cent.) The following list is made up from two sets of notes, in the same manner as the preceding.

TREES

10+21	*Pinus Taeda*	5+2	*Magnolia glauca*
8+20	*Pinus palustris*	1+4	*Cornus florida*
7+15	*Liriodendron Tulipifera*	4+0	*Salix nigra*
7+10	*Liquidambar Styraciflua*	0+3	*Quercus falcata*
1+9	*Nyssa biflora*	0+3	*Quercus marylandica*
2+7	*Quercus Catesbaei*	1+2	*Acer rubrum*
7+1	*Pinus serotina*	2+1	*Taxodium distichum*
4+3	*Taxodium imbricarium*	0+2	*Nyssa uniflora*

SHRUBS

2+3	(*Prunus angustifolia*)	2+2	*Myrica cerifera*
1+3	*Alnus rugosa*	0+3	(*Sassafras variifolium*)

HERBS

1+4	*Scirpus Eriophorum*	0+2	*Vernonia angustifolia*
0+4	*Eupatorium rotundifolium*	2+0	*Ludwigia suffruticosa*
4+0	*Tillandsia usneoides*	2+0	*Pontederia cordata*

This list contrasts with the preceding in many ways. The scarcity of (indigenous) visible herbs is striking. That seems to be characteristic of many originally well-wooded regions with vegetation approaching the climax, as compared with pine-barrens,

*Bull. Torrey Club 34: 364. 1907.

†A view of South Carolina 9–11. 1802.

‡"South Carolina" 71–116. 1883; Tenth Census U. S. 6: 481–488. 1884.

prairies, marshes, etc.* The abundance of *Pinus Taeda* also indicates the trend away from the typical pine-barren conditions which may be assumed to have existed here several thousand years ago. The frequency of *Pinus palustris* in a region with such characters is rather surprising, but that does not necessarily indicate that it is abundant. One tree of it on each side of the railroad every two or three miles would have been enough to give the above figures, 8 and 20.

The traveler going northward from Savannah would apparently here encounter *Cornus florida* and *Alnus rugosa* for the first time, but no species seem to have their northern limits in this belt.

On my route of 1909 the fall-line sand-hills begin in the upper edge of Orangeburg County, about 30 miles south of Columbia, and continue to Hamlet and beyond, interrupted only by the valleys of a few muddy rivers which rise in the Piedmont region. The sand-hill region is quite hilly, and nearly all the way through Lexington County one can get a splendid view to the eastward, clear across the valley of the Congaree River, and probably all the way to the "high hills of Santee."† Descriptions of this region can be found in nearly all general descriptions of South Carolina (which need not be specified here), but it is rarely mentioned in botanical literature. Only about 10 per cent. of the area was under cultivation in 1880, according to Hammond, but the proportion is of course considerably greater now.

The following list of plants is based on about 90 miles of observations in South Carolina, mostly in Lexington, Richland, and Kershaw counties, and 10 miles in Richmond and Scotland counties, North Carolina, besides what I saw in walking out a short distance from Hamlet. (On this walk of course I saw many plants that were too inconspicuous to be recognized from a train, but my rule of excluding species seen only once or twice in a region disposes of them.) The sand-hill plants belong principally to only two habitats, dry hills and bogs.

*In 1908 I found the same to be true on the Delaware peninsula, especially the southern half of it. (See Torreya 9: 222–223. 1909. With the weeds eliminated a similar state of affairs would have been evident in the other regional lists in the same paper.)

†See Drayton, View of S. C. 10. 1802; Hammond, "South Carolina" 110–111. 1883; Tenth Census U. S. 6: 486. 1884.

TREES

64 *Quercus Catesbaei*
50 *Pinus palustris*
18 *Nyssa biflora*
17 *Quercus marylandica*
15 *Pinus Taeda*
13 *Liriodendron Tulipifera*
8 *Cornus florida*
7 *Pinus serotina*
7 *Liquidambar Styraciflua*
7 *Quercus cinerea*
5 *Pinus echinata*
4 *Magnolia glauca*
3 *Populus deltoides* (along rivers)
3 *Chamaecyparis thyoides*
3 *Acer rubrum*

SHRUBS

6 *Alnus rugosa*
4 *Polycodium caesium*
4 *Phoradendron flavescens*
3 *Clethra alnifolia*
3 *Arundinaria tecta*
3 (*Prunus angustifolia*)

HERBS

29 *Silphium compositum*
14 *Vernonia angustifolia*
12 *Dasystoma pectinata*
12 *Eriogonum tomentosum*
10 *Eupatorium rotundifolium*
6 *Angelica hirsuta*
6 *Baptisia Serenae ?*
5 *Pteris aquilina*
4 *Osmunda cinnamomea*
4 *Carduus repandus*
3 *Nolina georgiana*

The frequency of *Pinus palustris* has of course been diminished by the same causes previously mentioned. About ten years ago, when that part of the Seaboard Air Line between Columbia and Hamlet had just been completed, this pine should have been seen nearly every mile, or about 100 times. Of the other plants associated with it here, *Polycodium*, *Eriogonum*, *Baptisia*, and *Nolina* were seen only in South Carolina on this trip, and they probably do not extend any farther north; while *Dasystoma pectinata*, *Carduus repandus*, and a few species seen less than three times were noticed a few miles over the state line in North Carolina, but no farther.

From about Laurel Hill to Rosindale, N. C., a distance of 63 miles, the country is mostly rather level, damp and sandy, with no ponds, but many shallow bogs and non-alluvial swamps, and a few pocosins toward the southeast. (The first few miles, and indeed most of Scotland County, is more hilly than the rest, and should perhaps be correlated with the parts of Orangeburg County, S. C., passed through the day before, but the hilly part is so limited that it will not introduce any serious error to include it with the rest.) This kind of country, with slight modifications, seems to extend southeastward most of the way across South Carolina,

but not into Georgia. It has been described by Kerr* and by Ashe,† but they did not clearly indicate its boundaries, and it is indeed difficult to do so. A pretty good description of a part of it is the U. S. soil survey of Robeson County, by W. E. Hearn and others, published in October, 1909.

Pinus Taeda is the prevailing tree, this being far out of the range of *P. Elliottii*, which occupies somewhat similar habitats farther south. The woods are mostly rather open, with a herbaceous vegetation much like that of regular pine-barrens. While traversing this region on July 27, 1909, my observations were hindered somewhat by frequent showers, but the following list is probably representative enough.

TREES

47 *Pinus Taeda*
25 *Nyssa biflora*
17 *Quercus marylandica*
15 *Liquidambar Styraciflua*
15 *Acer rubrum*
14 *Pinus palustris*
12 *Pinus serotina*
11 *Taxodium imbricarium*
10 *Cornus florida*
10 *Magnolia glauca*
10 *Quercus falcata*
8 *Liriodendron Tulipifera*
5 *Salix nigra*
4 *Quercus Catesbaei*
3 *Taxodium distichum*
2 *Nyssa uniflora*

SHRUBS

9 *Clethra alnifolia*
5 *Cyrilla racemiflora*
4 *Alnus rugosa*
3 (*Sassafras variifolium*)
3 *Myrica cerifera*
3 *Smilax laurifolia*

HERBS

35 *Eupatorium rotundifolium*
24 *Sarracenia flava*
8 *Habenaria blephariglottis*
7 *Marshallia graminifolia*
6 *Polygala ramosa*
6 *Vernonia angustifolia*
6 *Nymphaea sagittifolia*
5 *Eriocaulon decangulare*
5 *Polygala lutea*
4 *Lespedeza capitata sericea*
4 *Osmunda cinnamomea*
3 *Rhexia Alifanus*
3 *Zygadenus glaberrimus*
3 (*Helenium tennifolium*)
2 *Afzelia cassioides*
2 *Scirpus Eriophorum*
2 *Chondrophora nudata*
2 *Sabbatia lanceolata*
2 (*Leptilon canadense*)
2 *Baldwinia uniflora*
2 *Xyris* sp.

Sarracenia flava, which was not seen at all between Savannah and Hamlet, here occurs in abundance. *Marshallia graminifolia* likewise appears in this list for the first time. A few of the rarer plants will be mentioned more particularly in a subsequent paper.

*Tenth Census U. S., vol. 6. 1884.

†N. C. Geol. Surv. Bull. 5 and 6. 1894 and 1898.

Extending out from Wilmington in all directions (that is, on the land side) for thirty or forty miles is a most interesting area of genuine pine-barrens, long noted for being the home of *Dionaea muscipula* and several other local species. In general this region is nearly level, except near some of the streams, where the topography somewhat resembles that of the Altamaha Grit region of Georgia. Pocosins* are frequent, savannas are occasional, and lakes and ponds are rare or wanting. There seems to be no marked difference in topography or soil between this region and the preceding, and they intergrade over a zone perhaps ten miles wide. This and other circumstances seem to indicate that the boundary is determined by succession of vegetation more than anything else, that the pine-barrens were formerly more extensive, and that the short-leaf pine forests are tending to close in on them and will ultimately "wipe them off the map" (that is, if man does not do so first, which is more likely).

The Wilmington or Cape Fear pine-barren region as here treated coincides almost exactly with that part of eastern North Carolina in which according to Kerr† less than one tenth of one per cent. of the area was cultivated in cotton in 1880. Descriptions of it have been published by Emmons, Kerr, Ashe, and others, and pretty good floras of parts of it by Curtis in 1835 and Wood & McCarthy in 1887.‡ The U. S. soil survey of New Hanover County, by Drake & Belden (February, 1907) covers the very focus of it, and Circular 20 of the Bureau of Soils, by H. H. Bennett (January, 1910) contains a preliminary report on the soils and some other geographical features of Pender County.§

*See Bull. Torrey Club **34**: 361–362. 1907; also C. A. Davis, N. C. Geol. Surv. Econ. Paper 15: 149–150. 1910 (erroneously dated 1908).

†Tenth Census U. S., vol. 6, map 13.

‡For more complete references to these works see my 1907 paper.

§It is probably something more than a mere coincidence that the summers are a little wetter in this Cape Fear region than in adjoining regions or in many places where the native vegetation more nearly approaches the climax condition and there is more land under cultivation. At Wilmington, according to the latest statistics I have been able to obtain, 49.4 per cent. of the total annual precipitation occurs in the four warmest months, June to September, inclusive.

For a number of other places in the coastal plain within a few hundred miles of Wilmington the same factor is somewhat lower, as follows:—Norfolk, Va., 40 per cent.; Tarboro, N. C., 41.0; Goldsboro, N. C., 43.6; New Bern, N. C., 45.2; Cape Hatteras (one of the rainiest places in the Eastern Unites States outside of the moun-

In 1906 I passed through this region from about Lake Waccamaw to Wilmington, 36 miles, and from Wilmington to the northern boundary of Pender County, 35 miles; and in 1909 from Rosindale to Wilmington, 37 miles, and Wilmington to Verona, 43 miles. The following list of plants has been compiled from the notes of both trips in the manner previously described. In my account of the first trip* I gave a systematic list of species which seemed to be more abundant near Wilmington than in some other places. As might have been expected, the present list, which shows approximately the relative abundance of some of the more conspicuous plants in the Cape Fear region, contains many of the same species, though the two lists are by no means identical.

TREES

18+53	*Pinus palustris*	2+12	*Taxodium imbricarium*
17+40	*Pinus serotina*	7+7	*Taxodium distichum*
12+26	*Magnolia glauca*†	4+7	*Quercus marylandica*
1+27	*Gordonia Lasianthus*	5+6	*Liriodendron Tulipifera*
13+15	*Pinus Taeda*	0+9	*Acer rubrum*
3+22	*Nyssa biflora*	1+8	*Quercus falcata*
5+20	*Quercus Catesbaei*	0+3	*Persea pubescens*
3+12	*Cornus florida*	2+1	*Quercus cinerea*
6+9	*Liquidambar Styraciflua*		

SHRUBS

12+20	*Clethra alnifolia*	6+10	*Myrica cerifera*
4+27	*Smilax laurifolia*	2+10	*Ilex glabra*
7+20	*Cyrilla racemiflora*	1+4	*Phoradendron flavescens*
3+15	*Myrica pumila*	2+2	*Amorpha herbacea*

HERBS

19+31	*Sarracenia flava*	3+3	*Chondrophora nudata*
9+22	*Aristida stricta*	3+3	*Tillandsia usneoides*

tains), 35.8; Lumberton, N. C., 41.2; Florence, S. C., 46.1; Statesburg, S. C., 41.7; Blackville, S. C., 42.5; St. George, S. C., 47.8; Altamaha Grit region of Georgia, 43.9 per cent. The Piedmont region seems to have about 35 per cent. of its annual rainfall in these four months.

Mere distance from the coast does not seem to have much to do with these figures, as shown by the great difference between those for Wilmington and Cape Hatteras. Latitude and altitude are probably equally inadequate to explain the variation. In general a heavy summer rainfall (in Eastern North America at least) seems to correspond approximately with pioneer vegetation, such as open pine forests. But this seasonal distribution of precipitation could hardly be considered the sole cause of the condition of the vegetation, for that can often be correlated with soil and geological history. May not this type of rainfall then perhaps be partly the effect rather than the cause of pioneer vegetation?

*Bull. Torrey Club **34**: 365. 1907.

†Often only a shrub.

8+22	*Eriocaulon decangulare*	3+3	*Dichromena latifolia*
17+10	*Rhexia Alifanus*	0+5	*Oxypolis filiformis*
13+13	*Polygala lutea*	1+4	*Osmunda cinnamomea*
8+13	*Eupatorium rotundifolium*	2+3	(*Acanthospermum australe*)
0+17	*Trilisa odoratissima*	2+3	*Vernonia angustifolia*
5+11	*Zygadenus glaberrimus*	3+2	*Tofieldia racemosa*
9+6	*Polygala ramosa*	3+2	*Xyris* sp.*
3+8	*Marshallia graminifolia*	1+3	*Pteris aquilina*
10+0	*Campulosus aromaticus*	1+3	*Scirpus Eriophorum*
2+5	*Sabbatia lanceolata*	2+2	*Pontederia cordata*
2+5	(*Helenium tenuifolium*)	1+2	*Polygala cymosa*
4+3	*Lilium Catesbaei*	1+2	*Silphium compositum*
2+4	*Habenaria blephariglottis*		

Rhexia Alifanus, *Polygala ramosa*, *Campulosus aromaticus*, and *Lilium Catesbaei* were seen oftener along my 1906 route through this region than on that of 1909, and *Gordonia*, *Nyssa biflora*, *Quercus Catesbaei*, *Cornus florida*, *Taxodium imbricarium*, *Acer rubrum*, *Quercus falcata*, *Smilax laurifolia*, *Myrica pumila*, *Ilex glabra*, *Phoradendron*, *Trilisa*, *Oxypolis*, and *Osmunda cinnamomea* at least four times as often on the second trip as on the first, which seems rather singular. Some of these cases may be due simply to my own carelessness, but others probably indicate local irregularities of distribution. Other evidence of such irregularities is found in the fact that in each year I noted several fairly abundant species in this region either on one side or the other of Wilmington and not on both. It would be very interesting if some other botanist would go through the same region at the same season, either by one of the same routes or by a different combination of routes (Wilmington has five lines of railroad radiating from it, all passing through the pine-barrens for approximately the same distance), and take notes in the same way and compare his results with the above.

It happens that all the species here recorded from the Cape Fear pine-barrens occur also in Georgia† (and with approximately the same relative frequency), while several of them, such as *Gordonia*, *Persea*, *Cyrilla*, *Myrica pumila*, *Amorpha*, *Aristida stricta*,

*Probably *X. flexuosa* (*X. torta* of many authors) and one or two others.

†From which it follows that the local species peculiar to this region are either rare, or inconspicuous in midsummer (or both), or else that I do not know them well enough to recognize them from a moving train.

Polygala lutea, *Trilisa*, *Sabbatia lanceolata*, *Habenaria blephariglottis*, and *Chondrophora*, were not seen at all in South Carolina, in either year, and a number of others seem to be rare in that state. In this connection it is extremely interesting to note that on Dr. Hilgard's agricultural map of the southeastern states* (which by the way is undoubtedly the best vegetation map of that part of the country ever published), he assigned the Cape Fear pine-barrens to the same subdivision as the Altamaha Grit region of Georgia (together with certain parts of other states), but skipped South Carolina with this subdivision entirely. This idea of Dr. Hilgard's is all the more remarkable when one observes that the agricultural maps of the individual states involved (in the sixth volume of the same series) give scarcely a hint of this state of affairs.†

Quercus Catesbaei, *Q. cinerea*, *Marshallia*, *Chondrophora*, *Oxypolis*, *Vernonia*, *Tofieldia*, and *Polygala cymosa* were not seen any more after leaving the pine-barrens, and three of these, the *Marshallia*, *Oxypolis*, and *Polygala*, were not even seen northeast of Wilmington. All except the *Marshallia* and *Vernonia* are known or supposed to extend considerably farther north, but they cannot be very common along the route that I traveled from Wilmington to New York.

On reaching the banks of the estuary of New River in Onslow County, half way between Wilmington and New Bern, I left the pine-barrens behind. From there to Mackey's Ferry on Albemarle Sound, a distance of about 122 miles, I was in a country very similar in most respects to that between Laurel Hill and Rosindale in the same state, and probably connected with it, but with certain differences in vegetation which I am not quite prepared to explain. This part of the journey should perhaps be subdivided further, for low hills with hammock-like vegetation were‡ fre-

*The first map in the fifth volume of the Tenth Census reports.

†Another interesting fact in this connection is that Dr. Eugene A. Smith about the same time published a map of similar import (the first map in the fourth report of the U. S. Entomological Commission), based on essentially the same data, which combines the various kinds of pine-barrens under one color, making no distinction between those of South Carolina and other states; but this may be due only to the fact that this map is smaller and does not attempt to show so much detail.

‡I once supposed (see Science II. 22: 401. 1905) that the term "hammock" was used in North Carolina, but the only evidence I had (U. S. Geol. Surv. Bull.

quent in some places and pocosins (almost the other extreme) in others; but for the present I can do no better than treat it as a unit. Three or four estuaries were crossed in this distance, but most of the plants characteristic of their marshes were not seen often enough to be included in the following list.

A considerable part of this region is described in the U. S. soil survey of the "Craven area," by Smith and Coffey, published in January, 1905. Important botanical papers on the same region have been published by Croom* and by McCarthy.† The railroad between New Bern and Washington, a distance of about 35 miles, had been in operation only a year or two, so that I found the vegetation along there more nearly in a natural condition than in most other parts of this journey.

The plant list for these 122 miles is as follows:

TREES

104	*Pinus Taeda*	12	*Quercus marylandica*
71	*Liquidambar Styraciflua*	10	*Taxodium distichum*
57	*Nyssa biflora*	9	*Quercus alba*
35	*Cornus florida*	8	*Salix nigra*
27	*Pinus serotina*	7	*Fagus grandifolia*
26	*Magnolia glauca*	7	*Gordonia Lasianthus*
25	*Oxydendron arboreum*	5	*Ilex opaca*
24	*Pinus palustris*	4	*Quercus Phellos*
19	*Acer rubrum*	3	*Nyssa uniflora*
18	*Liriodendron Tulipifera*	3	*Taxodium imbricarium*
15	*Quercus falcata*	3	*Quercus stellata*

SHRUBS

23	*Myrica cerifera*	11	*Clethra alnifolia*
21	*Cyrilla racemiflora*	6	*Phoradendron flavescens*
13	*Ilex glabra*	5	*Aralia spinosa*
12	*Alnus rugosa*	3	*Pieris nitida*
12	*Smilax laurifolia*	3	*Decodon verticillatus*
12	*Arundinaria tecta*		

HERBS

23	*Eupatorium rotundifolium*	5	*Rhexia Alifanus*
18	*Sarracenia flava*	5	*Osmunda cinnamomea*
10	*Habenaria blephariglottis*	5	*Polygala ramosa*
9	*Tillandsia usneoides*	4	*Xyris* sp.

84: 72. 1892) was its use by a man who had seen hammocks in the states farther south, so that it may not have been really indigenous to that locality (the "natural well" of Duplin County).

*A catalogue of plants . . . in the vicinity of New Bern, . . . 1837.

†Bot. Gaz. 10: 384, 385. 1885; 12: 76–78. 1887.

8 (*Rynchospora inexpansa*)	4 (*Senecio tomentosus*)
7 *Aristida stricta*	4 (*Leptilon canadense*)
7 *Polygala lutea*	3 *Sabbatia lanceolata*
6 *Eriocaulon decangulare*	3 *Pontederia cordata*

Pinus echinata must have once occurred in this region, according to Pinchot & Ashe,* but I did not see any of it. *Oxydendron*, *Quercus alba*, *Fagus*, *Ilex opaca*, and *Senecio tomentosus* make their first appearance in this list, and *Cornus florida*, *Taxodium distichum*, *Quercus Phellos*, *Myrica cerifera*, *Aralia spinosa*, and *Rynchospora inexpansa* are decidedly more frequent here than in most of the preceding lists. (Most of the twelve species last mentioned seem to be still more common in southeastern Virginia.†) On the other hand, *Pinus palustris*, *Gordonia*, *Taxodium imbricarium*, *Cyrilla*, *Ilex glabra*, *Clethra*, *Pieris*, *Sarracenia*, *Tillandsia*, *Aristida*, *Rhexia Alifanus*, *Polygala ramosa*, and *Sabbatia lanceolata* (as well as several equally interesting species noted less than three times and therefore not listed here) were now seen for the last time. Nearly all of these last are known or supposed to extend at least a short distance into Virginia, west of Dismal Swamp, but the rest of my route to Norfolk lay farther east.

From Mackey's Ferry the cars were taken across Albemarle Sound (and the 36th parallel) to Edenton, the county-seat of Chowan County, on a nine-mile ferry (since superseded by a trestle). From about this point what Prof. Shaler termed the Nansemond escarpment‡ extends northward past the western edge of Dismal Swamp to the vicinity of Suffolk, Va. From Edenton to Norfolk, 73 miles, I was east of this escarpment all the way, skirting the eastern edge of the swamp, and passing though a region quite different from anything else seen on this trip. It is rather flat, with prevailingly loamy or even silty soil, quite different from the sandy soil that prevails at corresponding distances from the coast most of the way from New York to New Orleans. There are many shallow swamps but apparently no ponds. The uplands, or drier spots, were nearly all cleared and cultivated long

*N. C. Geol. Surv. Bull. 6: 130, 150. 1898.

†See Bull. Torrey Club **34**: 366. 1907; Torreya **9**: 223, 224. 1909.

‡Ann. Rep. U. S. Geol. Surv. 10[1]: 314, 317, 326–331. *pl. 6, 12–14. f. 28, 34–36.* 1890. See also Kearney, Contr. U. S. Nat. Herb. **5**: 332. 1901.

ago,* so that not much is left of their original vegetation. In topography, soil, vegetation, proportion of cleared land, and a few other features, this region strikingly resembles some river-bottoms farther south, particularly in the Cretaceous region of Georgia and Alabama.†

This region was mapped by Kerr in 1884‡ as the "oak and beech flats with short-leaf pine," and parts of it have since been described by Shaler in the work just cited, by Kearney in his well-known Dismal Swamp report, by Darton in the "Norfolk folio" of the U. S. Geological Survey,§ and by J. E. Lapham and others in the government soil surveys of the "Norfolk area," Virginia, and Pasquotank, Perquimans, and Chowan counties, North Carolina.

The plants observed between Edenton and Norfolk are as follows:

TREES

39	*Pinus Taeda*	8	*Nyssa uniflora*
37	*Liquidambar Styraciflua*	6	*Cornus florida*
16	*Taxodium distichum*	5	*Liriodendron Tulipifera*
12	*Acer rubrum*	5	*Magnolia glauca*
11	*Fagus grandifolia*	4	*Quercus Phellos*
9	*Nyssa biflora*	3	*Quercus falcata*
9	*Salix nigra*	3	*Quercus alba*
9	*Pinus serotina*	3	*Oxydendron arboreum*

SHRUBS

17	*Arundinaria tecta*	4	*Phoradendron flavescens*
12	*Myrica cerifera*	2	*Aralia spinosa*
8	*Alnus rugosa*	2	*Smilax laurifolia*
6	*Rhus copallina*		

*The earliest permanent settlements in North Carolina were made in this very region about 260 years ago.

†Prof. Collier Cobb, in his North Carolina supplement to Redway & Hinman's Natural Advanced Geography, states that the first settlers were attracted to this region by the "magnificent bottom land," among other things. (He tells me that this quotation is from pages xxi–xxii of the prefatory notes to vol. 1 of the Colonial Records of North Carolina, by Col. Wm. L. Saunders.)

‡Tenth Census U. S., vol. 6, map 12.

§Geologic Atlas of the U. S., Folio no. 80. 1902. Unlike most of the earlier folios of this series, this one contains several excellent illustrations of the vegetation and other scenery (which Mr. Darton tells me are from photographs taken by the late Prof. I. C. Russell). Some of the same pictures were used before in the reports of Shaler and Kearney already cited, and some have appeared more recently in various semipopular magazines, mostly in connection with articles advocating the annihilation of swamps.

HERBS

13 (*Senecio tomentosus*)
7 *Eupatorium rotundifolium*
6 *Anchistea virginica*
5 (*Daucus Carota*)
5 *Scirpus Eriophorum*
4 (*Rynchospora inexpansa*)
3 (*Ambrosia artemisiifolia*)
3 *Typha latifolia*
3 *Habenaria blephariglottis*
2 *Pontederia cordata*
2 *Saururus cernuus*
2 *Pteris aquilina*
2 (*Oenothera biennis*)
2 *Nymphaea advena*
2 *Sabbatia angularis**

Many of the above species are especially characteristic of bottom-lands. But *Acer rubrum*, *Pinus serotina*, *Magnolia glauca*, *Smilax laurifolia*, *Eupatorium rotundifolium*, *Anchistea*, and *Habenaria* indicate occasional sandy bog conditions, perhaps connected with prongs of the Dismal Swamp.

The only plants in this list that had not been seen farther south are *Daucus Carota* and *Saururus cernuus*. The former, a well-known weed, appeared commoner than any native herb all the way from the southern boundary of Virginia to New York, except in the New Jersey pine-barrens. *Pinus serotina*, *Arundinaria*,† *Phoradendron*, *Senecio tomentosus*, *Rynchospora inexpansa*, and a few species noted only once and therefore not mentioned here, were not seen north of Norfolk.

From Newport News on the coast (in latitude 37°) to Richmond at the fall-line, a distance of 75 miles, the country is moderately undulating (with considerable bluffs along some of the estuaries), the soil rather loamy, and the forests comparatively dense, with no suggestion of pine-barrens. The proportion of cleared land was less than I expected to find along a railroad 28 years old, in a region that has been settled for 300 years,‡ but perhaps very little of the forest is primeval.

A considerable portion of this peninsula between the York and James rivers has been described by Burke & Root in their soil survey of the "Yorktown area," published in April, 1907. There are few direct references to this part of Virginia in botanical

*Seen only near the second mile-post north of Northwest, Va., which is pretty close to the only station recorded for it by Mr. Kearney.

†Several years ago I saw this from the Pennsylvania R. R. at a point between Washington and Baltimore which Dr. Forrest Shreve tells me is the only known station for it in Maryland. On this trip I looked for it again there but did not happen to see it.

‡My route passed within six miles of Jamestown and still nearer to Yorktown.

literature, though Clayton probably explored the territory pretty thoroughly in the eighteenth century,* and a few plants were collected near Mobjack Bay, a little farther east, in the nineteenth century.†

The following list of plants will give some idea of the general appearance of the vegetation at the present time.

TREES

41 *Pinus Taeda*
28 *Liquidambar Styraciflua*
19 *Liriodendron Tulipifera*
19 *Cornus florida*
18 *Quercus alba*
18 *Pinus virginiana*
13 *Acer rubrum*
12 *Fagus grandifolia*
11 *Pinus echinata*
10 *Quercus falcata*
9 *Quercus Phellos*
6 *Nyssa biflora ?*
6 *Salix nigra*
4 *Oxydendron arboreum*
3 *Taxodium distichum*
2 *Quercus marylandica*
2 *Nyssa uniflora*

SHRUBS

7 *Myrica cerifera*
3 (*Sassafras variifolium*)
2 *Alnus rugosa*

HERBS

9 (*Daucus Carota*)
3 *Pteris aquilina*
2 *Eupatorium purpureum*
2 *Nymphaea advena*

Trees are here much more numerous than conspicuous herbs, doubtless for the same reason as in the "middle districts" or "upper pine belt" of South Carolina, described a few pages back. The only new element in this list is *Pinus virginiana*, but that comes in rather suddenly, immediately taking its place considerably above the middle of the list.‡ *Oxydendron*, *Taxodium* and *Myrica* appear here for the last time. They all extend somewhat farther north, but only in the coastal plain, and after passing Richmond I kept too close to the fall-line to see them until I got entirely beyond their northern limits. This vegetation is naturally very similar to that of the Delaware peninsula, which I had examined in the same superficial way about a year before.§

I had about three hours to wait in Richmond, and while strolling about the city I was surprised to see "cut flowers" of *Polygala lutea*, *Sabbatia lanceolata*, and *Habenaria ciliaris*, typical pine-

*See Barnhart, Torreya 9: 242. 1909.
†See Leggett, Bull. Torrey Club **6**: 48–49. 1875.
‡See Torreya **9**: 226. 1909.
§See Torreya 9: 221–223. 1909.

barren bog plants, together with those of *Daucus Carota* and perhaps a few others, offered for sale in the markets by negro women. I had never found the first two myself within many miles of Richmond, but one would not suppose they had been brought very far for such a purpose, and it would be interesting to learn just where they did grow.

From Richmond to Doswell (*via* Hanover) my route was within a few miles of the fall-line, and from Doswell to Philadelphia it would seem from a small-scale map to be right on the fall-line, but in reality the coastal plain sediments overlap the metamorphic rocks a little all along here, so that the latter were hardly ever visible except on the banks of rivers. It will be safe enough therefore to regard the vegetation along this route as belonging to the coastal plain, as I did in the fall-line sand-hills of the Carolinas.

Some botanical notes made along very nearly the same route have been published by Prof. L. F. Ward.* The soil survey of Hanover County, Virginia, by Bennett and McLendon, published in May, 1907, covers a small part of it.

It is 84 miles, the way I went, from Richmond to Quantico, where I stopped taking notes on account of darkness. In this distance the following plants were noted.

TREES

30 *Pinus Taeda*
26 *Pinus virginiana*
35 *Liquidambar Styraciflua*
16 *Liriodendron Tulipifera*
14 *Acer rubrum*
14 *Quercus alba*
13 *Betula nigra*
13 *Cornus florida*
11 *Salix nigra*
11 *Pinus echinata*
9 *Quercus Phellos*
7 *Fagus grandifolia*
5 *Quercus palustris*
5 *Quercus falcata*
4 *Platanus occidentalis*
3 *Quercus stellata*
3 (*Robinia Pseudo-Acacia*)

SHRUBS

18 *Alnus rugosa*
9 (*Sassafras variifolium*)
3 *Cephalanthus occidentalis*

HERBS

12 (*Daucus Carota*)
7 *Scirpus cyperinus ?*
6 *Pteris aquilina*
3 *Nelumbo lutea*

Quercus palustris and *Robinia* here appear for the first time (the latter introduced), *Betula nigra* and *Nelumbo* for the

*Bot. Gaz. 11: 32–38. 1886.

only time, and *Pinus Taeda*, *Salix nigra*, *Liriodendron*, *Fagus*, and *Platanus* for the last time; but perhaps no special significance is to be attached to any of these facts. Practically all the species in the list are common both in the coastal plain and in the Piedmont region, as might have been expected, and trees are much more numerous than conspicuous herbs, for the same reason as before.

Skipping Maryland, Delaware, and Pennsylvania, for the reasons already given, we now come to New Jersey. From Camden to South Pemberton, a distance of 25 miles, I was in the Cretaceous region, which differs in no essential particular from the corresponding portions of Delaware, which I had traversed in the same manner and for approximately the same distance the year before.* Parts of it lying north and south of my route were described several years ago in the United States soil surveys of the Trenton and Salem areas, New Jersey. This region is so thickly settled that it is difficult to form an adequate idea of its original vegetation. The following pitiful remnants (and introduced weeds) were noticed.

TREES

3 *Acer rubrum*
3 *Castanea dentata*
3 (*Robinia Pseudo-Acacia*)
2 *Liquidambar Styraciflua*
2 *Quercus alba*
2 *Pinus virginiana*

SHRUBS

3 *Alnus rugosa*

HERBS

5 (*Daucus Carota*)
2 *Pteris aquilina*
2 *Nymphaea advena*
2 (*Trifolium arvense*)
2 (*Achillea Millefolium*)

Castanea dentata appears in this list only, and it happens that on my way southward the year before I saw it only in approximately the same kind of country in Delaware.

I traversed the celebrated pine-barrens of New Jersey for a distance of 31 miles, from South Pemberton to Barnegat Pier, where the salt-water vegetation begins. The papers bearing on this region are too numerous (and mostly too short) to be men-

*See Torreya 9: 219–221. 1909.

tioned in such a rudimentary description as this, but interested readers can easily find them.*

The plants which I was able to recognize more than once in this region are as follows.

TREES

34 *Pinus rigida*
8 *Chamaecyparis thyoides*
7 *Pinus echinata*
4 *Betula populifolia*
3 *Acer rubrum*
3 *Quercus marylandica*
3 *Quercus Prinus*
2 *Nyssa sylvatica ?*
2 *Quercus alba*

SHRUBS

16 *Quercus ilicifolia*
2 *Comptonia peregrina*
2 (*Sassafras variifolium*)

HERBS

19 *Pteris aquilina*
4 *Anchistea virginica*
4 *Lilium superbum*
3 *Osmunda cinnamomea*
2 *Habenaria blephariglottis*
2 *Lophiola aurea*

The species appearing for the first time in this list are *Pinus rigida*, *Quercus Prinus*, *Q. ilicifolia*, *Comptonia*, *Lilium superbum*, and *Lophiola*.

In botanical manuals one frequently sees the ranges of certain plants given as "Pine-barrens, New Jersey to Florida," etc., just as if the same kind of country extended all the way. But on this trip it was strongly impressed on me that the New Jersey pine-barrens are quite different from the southern ones. The two kinds do not even intergrade, for one can travel the whole length of the Delaware peninsula, from the fall-line to the coast, without seeing any pine-barrens of either kind.†

The differences between northern and southern pine-barrens seem to be more numerous than the similarities. Considering only characters observable from a train, the similarities are about as follows. Both are in the coastal plain and have sandy soil, with pioneer vegetation subject to frequent fires. Pines are the dominant trees, and oaks usually form a sort of lower story. Sour bogs and swamps are frequent. Both regions are comparatively thinly settled, and still have more forests than fields.

*There is however one work that deserves special mention, namely, the report on forests that accompanied the annual report of the state geologist of New Jersey for 1899. This is a volume of 327 pages, containing important contributions by Vermeule, Pinchot, Hollick, Gifford, and others, together with numerous maps and illustrations.

†See Torreya 9: 217, 218. 1909. Shreve, Plant life of Maryland 85–88. 1910.

Some of the differences are: The sand is coarser in New Jersey, and there seems to be no clay subsoil, and no ponds. The dominant pines and oaks are different (and the range of *Pinus rigida* does not even overlap that of *P. palustris*, and still less that of *P. Elliottii*). Shrubs are much more abundant (in individuals, not necessarily in species) in New Jersey, and herbs, especially grasses, correspondingly sparse. The southern pines are among the most valuable trees we have, while the northern ones are small and crooked, and even if they were larger they would be of little use except for fuel. *Chamaecyparis* is commoner in New Jersey than it is in pine-barrens of any other state.

The New Jersey pine-barrens probably find their nearest counterpart in those of Long Island, which I described about two years ago.* The principal difference is that those of New Jersey have more bogs to the square mile, and a richer flora even in the dry pine-barrens. New Jersey seems to have all the pine-barren plants that Long Island has, and several more besides. Of those listed above, *Pinus echinata* and *Lophiola* are not known on Long Island, while *Chamaecyparis*, *Quercus marylandica*, *Q. Prinus*, *Lilium*, and *Habenaria* do grow on the island but apparently not in the pine-barrens thereof.

On the whole trip from Savannah to Barnegat Pier, which involved about 775 miles of note-taking, the number of species of plants seen from the train (this excludes about 25 species which I saw only near Hamlet, as above explained) was about 220. Of these 61 were seen in Georgia, 103 in South Carolina, 135 in North Carolina, 70 in Virginia, and 50 in New Jersey. (The diversity of these figures of course depends more on the different distances traveled in each state than anything else, for the number of species seen on any route is probably approximately proportional to the square root of the distance, when other things are equal.)

About 100 of these plants were not seen often enough in any one region to be mentioned in this paper. Of those that are mentioned by name, 3 are ferns, 10 conifers, 22 monocotyledons and 88 dicotyledons; but ten or twelve of the dicotyledons are weeds. Some generalizations with respect to the distribution of the remaining 112 native species may be of interest.

*Torreya **8**: 1–9. 1908.

Nearly 37 per cent. are confined to the coastal plain, as far as known, while 32 per cent. extend into the adjacent Piedmont region (several of them even to the mountains), but not into the glaciated region. About 4.5 per cent are common to the glaciated region and coastal plain and not known elsewhere, while a little over 26 per cent. are rather widely distributed in Eastern North America. About 6 per cent. (including some of each of the three groups just mentioned) are supposed to occur also in the West Indies, but none are unquestionably native in the Old World.

Notes on the distribution of certain species of particular interest observed on this trip will appear in a subsequent paper.

TALLAHASSEE, FLORIDA.

Local flora notes—V*

NORMAN TAYLOR

AMARYLLIDACEAE

1. *Hypoxis hirsuta* (L.) Coville. Of all the stations in our range,† and there are a good many, none is at a greater elevation than 500 ft. The recent catalogue of Connecticut plants says of it, "Common." If it is found throughout that state it reaches greater altitudes than our collections show. No specimens are known from the Catskills or from the Pocono region.

IRIDACEAE

1. *Iris versicolor* L. There are a good many specimens from the range, only one of which, however, comes from south of Monmouth Co., N. J. This is a single specimen from Forked River, N. J. Is the plant ever found well within the pine-barren region? In the catalogue of New Jersey plants it is said "Common in the eastern and southern counties; less frequent in the northwestern part of the state." We have no specimens from the latter territory but a few along the eastern counties, one only from south of Monmouth Co.

2. *Iris Pseudacorus* L. General works say of this that it is established from Massachusetts to New Jersey. Our only specimen is from near Prince's Garden, at Flushing, L. I., and has all the hall marks of an accidental escape. Such a record cannot be construed into a logical basis of asserting that the plant is "established." A conservative interpretation of this would demand at least a three year's persistence of a reasonably large quantity of the plants. Has any one ever seen this plant growing

*Continued from Torreya **10**: 145–149. 1910.

†The local flora range as prescribed by the Club's Preliminary Catalogue of 1888 is as follows: All of the state of Connecticut; Long Island; in New York the counties bordering the Hudson River up to and including Columbia and Greene, also Sullivan and Delaware counties; all the state of New Jersey; and Pike, Wayne, Monroe, Lackawanna, Luzerne, Northampton, Lehigh, Carbon, Bucks, Berks, Schuylkill, Montgomery, Philadelphia, Delaware, and Chester counties in Pennsylvania.

in our range where there is every reason to suspect that the colony is a permanent feature?

3. *Sisyrinchium angustifolium* Mill. There are only three specimens of this from the range, and they fail to give any adequate idea of the plant's true distribution. All the Pocono region, the upper northwestern part of Connecticut, and the highland section of New Jersey are unrepresented in the collections. With a general range of "Newf. to N. J. and on the mountains to Va.," the plant should be more widely dispersed in our range than the specimens show.

4. *Sisyrinchium albidum* Raf. In the new catalogue of Connecticut plants there is a single specimen cited from New London. An old specimen in our collections, identified by Mr. Bicknell as this species, is from Morrisania, N. Y. City, a locality now completely built over. Otherwise, this western plant is not known from the range.

5. *Sisyrinchium intermedium* Bicknell. In Britton's Manual this plant is credited to southern New Jersey on the authority of E. P. Bicknell, who contributed the treatment of the genus. There are no specimens from the range and the catalogue of the Philadelphia Botanical Club makes no mention of the species.

ORCHIDACEAE*

1. *Cypripedium arietinum* R. Br. The plant is credited to the range in the Preliminary Catalogue of the Torrey Club, but there are no specimens to support this contention. There are rumors of its occurrence in the Orange Mts., N. J., but nothing definitely certain. Its northern distribution is such that the Orange Mts. locality would be a surprising extension of its range.

2. *Cypripedium acaule* Ait. There are over twenty stations for this species represented by specimens. All of these are below 1,000 ft. in altitude, and the plant is unknown, so far, in the Catskills. Can any one contribute specimens that will help to determine the altitudinal range of the species?

3. *Cypripedium Reginae* Walt. (*C. hirsutum* Mill., the name that must be used for our showy lady's slipper orchid). All

*The names used in the discussion of this family are those adopted by Dr. P. A. Rydberg in Britton's Manual. A few exceptions will be found, based on further studies by the same writer.

our specimens come from stations north of Poughkeepsie, N. Y. It is supposed to grow south [in the mountains?] to Georgia. The highland region of New Jersey and Pennsylvania should contain this plant, although no mention of it is made by the Philadelphia botanists, as occurring in the Pennsylvania region.

4. *Cypripedium parviflorum* Salisb. In New Jersey the most southerly point from which the plant is known is Lake Hopatcong. With a general known distribution from Newfoundland to Georgia, etc., the delimitation of this species in our range to the region north of upper New Jersey is probably quite wide of the mark. In New York we have specimens from Van Cortlandt Park, New York City, and Mt. Vernon, neither of which are materially south of the Jersey record.

5. *Cypripedium candidum* Muhl. In all the general works, in Britton's catalogue of New Jersey plants and in the Preliminary Catalogue of the Torrey Club this plant is credited to the range. The only specimen is an old one from "Swamp, Bergen, N. J." Otherwise the plant is unknown in our area.

6. *Cypripedium hirsutum* Mill. The name we must now use for this plant is *C. pubescens* Willd. Its distribution is about as the books indicate but specimens are lacking from all the Pennsylvania counties.

Note.—In Torreya **2**: 84–87, Dr. Rydberg calls attention to still another lady's slipper, a plant little known and inadequately understood. It is one of the yellow-flowered sorts, referable according to that writer to *C. flavescens* Red. Any specimens (particularly flowers preserved in fluid) would be very welcome in clearing up the identity of this species.

7. *Orchis rotundifolia* Pursh. In the Preliminary Catalogue of the Torrey Club this species was credited to the area, but apparently mistakenly so, as there are no specimens from the range. Its northern range almost precludes the idea of its occurrence in our area, the only likely place being the highest peaks of the Catskills.

8. *Gymnadeniopsis integra* (Nutt.) Rydb. Credited to our range in the Manual and definitely to Monmouth, Ocean, and Burlington counties, N. J., in the catalogue of New Jersey plants. There are no specimens and its distribution in the pine-barren is wholly conjectural, beyond that given above.

9. *Gymnadenia conopsea* R. Br. So far as known, this is the first record of the occurrence of this plant in America. It is a native of Europe. Our specimen is from Litchfield, Conn., and is undoubtedly authentic. Whether or not it is established there is unknown, as the collector of it does not remember it particularly. I am indebted to Dr. Rydberg for the determination of this unfamiliar orchid.

10. *Limnorchis huronensis* (Nutt.) Rydb. The only specimens are from Canaan, Conn., and Ulster Co., N. Y. Mt. Pleasant, Wayne Co., Pa., is cited in Porter's Flora of Pennsylvania and this is presumably backed by a specimen. Otherwise the distribution of the plant in our range is unknown.

11. *Limnorchis major* (Lange) Rydb. Only a single specimen from the range is known. This was collected at "North Yonkers," N. Y. (?). The general distribution of this species is from Greenland to New York. The New York part of this assertion is backed by our local flora plant, and in view of the fact that it is supposed to come from Yonkers the distribution is very poorly supported. A high Catskill plant might have been this species but it seems only reasonable that the label reading "North Yonkers" belongs to some other plant, and that if *L. major* is in our range at all, which is very doubtful, it may be in the higher Catskills. The specimen is correctly determined but the label probably belongs elsewhere.

12. *Lysias orbiculata* (Pursh) Rydb. The most southerly station represented in our collections is West Point, N. Y. With a general distribution that extends south [in the mountains] to North Carolina, the plant should be found in the highland region of New Jersey and Pennsylvania. It is fairly common in the Catskills.

13. *Blephariglottis cristata* (Michx.) Raf. Most of the specimens come from near Monmouth County, N. J. Its general distribution is supposed to be from New Jersey to Florida and any information as to the plant's distribution in southern New Jersey will be welcome.

14. *Blephariglottis grandiflora* (Bigel.) Rydb. This species is supposed to grow south [in the mountains?] to North Carolina. All our specimens are from upper New Jersey and the Catskill region. Nothing is known of this from southern New Jersey or from the Pennsylvania counties in our range.

15. *Blephariglottis psychodes* (L.) Rydb. This has the same general range as the preceding, and, so far as the local collections show, is restricted in our area to the same region as that species.

16. *Blephariglottis peramoena* (A. Gray) Rydb. The only specimen is from Chester Co., Pa. It is credited to New Jersey in the Manual but specimens are lacking to show its true distribution in that state. Has it been collected in the Cape May region?

17. *Pogonia divaricata* (L.) R. Br. The only specimen from the range is from Quaker Bridge, N. J. It does not seem credible that a species that is supposed to grow throughout southern Jersey is so localized as our specimens show. How far north in the pine-barren region may the plant be looked for?

18. *Isotria affinis* (Austin) Rydb. This plant is described as rare and local, and is supposed to grow from Connecticut to southern New York, Pennsylvania, and New Jersey. Our only specimen is from Closter, N. J., its type locality. According to the Connecticut botanists it is known only from New Haven and Stratford in that state. From where is it known in Pennsylvania?

19. *Triphora trianthophora* (Sw.) Rydb. With a general distribution from Vermont to Florida, our specimens from Palisades, New Jersey, and Elm Station, near Philadelphia, are grotesquely inadequate, as far as representing the distribution in the area is concerned. Any extension of the range will be welcome.

20. *Arethusa bulbosa* L. The specimens and all the books show that this plant becomes increasingly scarce northwards. The lower counties of Pennsylvania and New Jersey are well represented. All the counties in the former state above Chester, except one station in Wayne, are apparently lacking the plant. North of the New Jersey state line, New York is also not represented by specimens. The Connecticut botanists say that it is rare or local, but not a word as to its state distribution. What is the true distribution of this plant above the line of the coastal plain?

21. *Epipactis viridiflora* (Hoffm.) Reich. The only station for this in the range is the recently discovered one at Plainfield, N. J. This is a marked southerly extension of its range, and it should be expected in the mountains of Pennsylvania and in the Catskills. It is otherwise known from Syracuse and Niagara Falls.

22. *Listera cordata* (L.) R. Br. New Durham, N. J., and Wayne Co., Pa. are the only places within the range from which the plant has been collected, and it is apparently not known to the writers of local floras that bear on our region. The new Connecticut list makes no mention of the plant. The Pennsylvania flora has only the Wayne Co. station. A general range of from Labrador to New Jersey would argue a more extended representation than our limited collections show. It should be found in the Catskills.

23. *Listera australis* Lindl. A single specimen from a swamp southwest of Camden, N. J., is all there is to show for the range of this species. The New Jersey and Philadelphia lists both give another station, at New Brunswick, N. J. Otherwise, the distribution of the plant is unknown save for one station in Chester Co., Pa. The general range of from New York and New Jersey to Florida is scarcely borne out by our scanty material.

24. *Gyrostachys stricta* Rydb. No specimens from the range. General works credit it to our area, but apparently the only specifically recorded station is Norfolk, Conn. It is probably to be found in the adjacent mountains along the eastern edge of Columbia Co., N. Y., and perhaps also in the Catskills.

25. *Gyrostachys plantaginea* (Raf.) Britton. Our only specimen is from Flatbrookville, Sussex Co., N. J. Other recorded stations seem to indicate that so far as our local flora range is concerned the plant is confined to the Delaware River Valley, or its branches. Is this a correct assumption?

26. *Peramium ophioides* (Fernald) Rydb. So far as the specimens show, this plant is confined to the higher Catskills and the mountains of Pennsylvania. So far as known, it has never been reported from New Jersey but might be looked for in the northern hilly part of the state. *P. tesselatum* (Lodd.) Rydb. has a similar range and is restricted in the same way. Can either of the plants be found at an elevation less than 1,000 ft.?

27. *Achroanthes monophylla* (L.) Greene. With the single exception of Sam's Point, Ulster Co., N. Y., for which there is a specimen, the only recorded station for this species is Wayne Co., Pa. It is curious that the plant should not have been found in Delaware and Greene counties, N. Y.

28. *Aplectrum hyemale* (Muhl.) Torrey. The only specimen is from Peekskill, N. Y. The early numbers of the Bulletin of the Torrey Botanical Club credit it to Pine Plains, N. Y., and Closter, N. J., and other stations are recorded in northern New Jersey. From New Brunswick, N. J., southwards the plant is unknown, save a record in the Philadelphia catalogue from Swedesboro, Gloucester Co. The general distribution of "Ontario to Georgia" is too general to represent adequately the restricted range of this plant.

29. *Corallorhiza Corallorhiza* (L.) Karst. The only specimen is from the summit of Onteora Mt., Greene Co., N. Y. Where in the mountains of Pennsylvania, except Wayne Co. from which it is reported, may the plant be looked for?

30. *Corallorhiza Wisteriana* Conrad. With a general range from Massachusetts to Florida, the only recorded stations are from Chester and Philadelphia Co., Pa. There are no specimens. Is this delimitation correct?

NEW YORK BOTANICAL GARDEN.

Notes on Rutaceae — IV

PERCY WILSON

In the large collection of plants recently made in eastern Cuba by Dr. J. A. Shafer there are two species of Rutaceae which hitherto have apparently escaped recognition. Descriptions of them follow:

Ravenia Shaferi P. Wilson, sp. nov.

A glabrous shrub or tree, 4–7 m. tall, with a grayish bark. Leaves simple, elliptic to ovate, or occasionally somewhat obovate, 5–10 cm. long, 2–5 cm. broad, sessile or subsessile, entire, more or less revolute, acute or occasionally obtuse at the apex, acute or somewhat rounded at the base, glandular-punctate; inflorescence 2–7-flowered; sepals 4, very unequal, the two outer ovate to broadly ovate, 1–1.8 cm. long, 0.6–1.2 cm. broad, the two inner ovate to nearly oval, 5–7 mm. long, 4.5–5.5 mm. broad, all glandular-punctate; "corolla red," glandular-punctate, the tube cylindric, 1.2–1.5 cm. long, the lobes 4, unequal, oblong to oblong-obovate, 1.4–2 cm. long, 0.8–1 cm. broad; stamens 4, adnate to the throat of the corolla, the two inferior ones fertile, sessile, the two superior ones sterile, linear to subulate, flattened; disk cup-shaped; ovary 4-lobed, 4-celled, immersed in the disk; style filiform; stigma 4-lobed.

Type collected in alluvial valley of Rio Yamaniguey, Province of Oriente, Cuba, *Shafer 4218*.

DISTRIBUTION: Eastern Cuba.

The other species of *Ravenia*, so far as I know, are 5-merous.

Spathelia cubensis P. Wilson, sp. nov.

A slender, branchless tree, 1–3 m. tall; new growth and under surface of the young foliage velvety with a reddish stellate pubescence intermixed with simple hairs. Leaves odd-pinnate, 3–3.5 dm. long, the rachis wingless, narrowly grooved above, velvety when young, glabrous or nearly so with age; leaflets 41–57, those on the branches of the inflorescence fewer in number, oblong, 3–7 cm. long, 6–10 mm. broad, sessile, entire, more or less revolute, acutish or rounded at the gland-tipped apex, cordate or sometimes inequilateral at the base, dull green above and glabrous, paler be-

neath and more or less stellate-pubescent; inflorescence paniculate, the branches glabrous or nearly so; flowers scarlet; sepals elliptic, 3–3.5 mm. long, 2 mm. broad, gland-tipped, acutish; petals elliptic-oblong or oblong, 5–6 mm. long, 2–3 mm. broad, gland-tipped, acutish, filaments with wing-like appendages at the base, anthers oblong; ovary glabrous, three-angled.

Type collected in dry rocky places, Sierra Nipe, along trail from Piedra Gorda to Woodfred, Province of Oriente, Cuba, *Shafer 3091;* collected also by Wright (*2192*) at Mayari.

DISTRIBUTION: Eastern Cuba.

NEW YORK BOTANICAL GARDEN.

INDEX TO AMERICAN BOTANICAL LITERATURE

(1910)

The aim of this Index is to include all current botanical literature written by Americans, published in America, or based upon American material; the word America being used in its broadest sense.

Reviews, and papers which relate exclusively to forestry, agriculture, horticulture, manufactured products of vegetable origin, or laboratory methods are not included, and no attempt is made to index the literature of bacteriology. An occasional exception is made in favor of some paper appearing in an American periodical which is devoted wholly to botany. Reprints are not mentioned unless they differ from the original in some important particular. If users of the Index will call the attention of the editor to errors or omissions, their kindness will be appreciated.

This Index is reprinted monthly on cards, and furnished in this form to subscribers, at the rate of one cent for each card. Selections of cards are not permitted; each subscriber must take all cards published during the term of his subscription. Correspondence relating to the card-issue should be addressed to the Treasurer of the Torrey Botanical Club.

Bailey, I. W. Anatomical characters in the evolution of *Pinus*. Am. Nat. **44**: 284–293. *pl. 2*. My 1910.

Bailey, I. W. Notes on the wood structure of the *Betulaceae* and *Fagaceae*. Forest. Quart. **8**: 178–185. *f. 1–9*. Je 1910.

Bailey, W. W. The flowering raspberry. Am. Bot. **16**: 37–39. [Jl] 1910.

Barnes, C. R. The nature of physiological response. Am. Nat. **44**: 321–332. Je 1910.

Read at sixteenth annual meeting of the Botanical Society of America.

Bessey, C. E. Some European forest notes. Forest. Quart. **8**: 201–209. Je 1910.

Blumer, J. C. A comparison between two mountain sides. Plant World **13**: 134–140. Je 1910.

Blumer, J. C. The vitality of pine seed in serotinous cones. Torreya **10**: 108–111. 26 My 1910.

Bovie, W. T. The effects of adding salts to the soil on the amount of non-available water. Bull. Torrey Club **37**: 273–292. *f. 1*. 21 Jl 1910.

Brandegee, T. S. Plantae Mexicanae Purpusianae—II. Univ. California Publ. Bot. **4**: 85–95. 26 My 1910.

Britton, N. L. Botanical exploration in Santa Clara, Cuba. Jour. N. Y. Bot. Gard. **11**: 109–117. My 1910.

Brown, H. B. The genus *Crataegus*, with some theories concerning the origin of its species. Bull. Torrey Club **37**: 251–260. 2 Je 1910.

Buchanan, R. E. *Monascus purpureus* in silage. Mycologia **2**: 99–108. *pl. 22, 23+f. 1, 2.* 9 Je 1910.

C[lute], W. N. Rare forms of fernworts—XIV. Some variations of *Polypodium*. Fern Bull. **18**: 47–49. [My] 1910. [Illust.]

Clute, W. N. The aggressiveness of plants. Am. Bot. **16**: 39–41. [Jl] 1910.

Clute, W. N. The Philippine pedate bracken. *Doryopteris ludens*. Fern Bull. **18**: 43–45. [My] 1910. [Illust.]

Clute, W. N. The plants of the sand barrens. Am. Bot. **16**: 33–37. [Jl] 1910.

Coulter, J. M. Practical science. Science II. **31**: 881–889. 10 Je 1910.

Davidson, A. *Acrolasia tridentata* n. sp. Bull. So. California Acad. Sci. **9**: 71. Jl 1910.

Deane, W. A fourth *Pinus rigida* for Coos County, New Hampshire. Rhodora **12**: 99. 27 My 1910.

Dobbin, F. *Tetraplodon australis* in Massachusetts. Rhodora **12**: 156. 14 Jl 1910.

Dodge, C. K. Plants growing wild and without cultivation in the County of Lambton, Ontario. Ottawa Nat. **24**: 45–52. 8 Je 1910.

Dodge, R. Variation in *Botrychium ramosum*. Fern Bull. **18**: 33–43. [My] 1910.

East, E. M. Inheritance in potatoes. Am. Nat. **44**: 424–430. Jl 1910.

Eggleston, W. W. *Crataegus viridis* L. in Virginia. Rhodora **12**: 93, 94. 27 My 1910.

Eichlam, F. Beiträge zur Kenntnis der Kakteen von Guatemala—IX. Monats. Kakteenk. **20**: 65–69. 15 My 1910.

Farlow, W. G. A consideration of the "Species Plantarum" of Linnaeus as a basis for the starting point of the nomenclature of cryptogams. Am. Nat. **44**: 385–394. Jl 1910.

Farlow, W. G., & Atkinson, G. F. The botanical congress at Brussels. Science II. **32**: 104–107. 22 Jl 1910.

Fernald, M. L., & Wiegand, K. M. The North American variations of *Juncus effusus*. Rhodora **12**: 81–93. 27 My 1910.

Fink, B. The lichens of Minnesota. Contr. U. S. Nat. Herb. **14**: 1–269 +i–xvii. *pl. 1–51+f. 1–18.* 1 Je 1910.

Gardner, N. L. *Leuvenia*, a new genus of Flagellates. Univ. California Publ. Bot. **4**: 97–106. *pl. 14.* 26 My 1910.

Grout, A. J. Mosses with hand-lens and microscope 5: 320–416. *pl. 76–87* +*f. 166–220.* Jl 1910.

Gürke, M. *Echinocactus Lecontei* Engelm. Monats. Kakteenk. **20**: 69–73. 15 My 1910. [Illust.]

Gürke, M. *Rhipsalis hadrosoma* G. A. Lind. Monats. Kakteenk. **20**: 77, 78. 15 My 1910.

Harris, J. A. A quantitative study of the morphology of the fruit of the bloodroot, *Sanguinaria canadensis.* Biometrika **7**: 305–351. *f. 1.* Ap 1910.

Harter, L. L. The starch content of leaves dropped in autumn. Plant World **13**: 144–147. Je 1910.

Haynes, C. C. *Sphaerocarpos hians* sp. nov., with a revision of the genus and illustrations of the species. Bull. Torrey Club **37**: 215–230. *pl. 25–32.* 2 Je 1910.

Hedgcock, G. G. A new polypore on incense cedar. Mycologia **2**: 155, 156. 9 Je 1910.

Polyporus amarus sp. nov.

Hollick, A. A new fossil fucoid. Bull. Torrey Club **37**: 305–307. *pl. 33.* 21 Jl 1910.

Thamnocladus passifrons sp. nov.

H[owe], M. A. Editorial note. In Thompson, E. I., The morphology of *Taenioma.* Bull. Torrey Club **37**: 98. 31 Mr 1910.

Humphreys, E. W. The name *Buthotrephis gracilis* Hall. Bull. Torrey Club **37**: 309–311. 21 Jl 1910.

Humphreys, E. W. Variation among non-lobed *Sassafras* leaves. Torreya **10**: 101–108. *f. 1–8.* 26 My 1910.

Jeffrey, E. C. A new araucarian genus from the Triassic. Proc. Boston Nat. Hist. Soc. **34**: 325–332. *pl. 31–32.* Jl 1910.

Jeffrey, E. C. A new *Prepinus* from Martha's Vineyard. Proc. Boston Nat. Hist. Soc. **34**: 333–338. *pl. 33.* Jl 1910.

Kern, F. D. Prediction of relationships among some parasitic fungi. Science II. **31**: 830–833. 27 My 1910.

Knowlton, C. H. Note on *Scheuchzeria palustris* L. Rhodora **12**: 156. 14 Jl 1910.

Lewis, I. F. Periodicity in *Dictyota* at Naples. Bot. Gaz. **50**: 59–64. *f. 1.* 14 Jl 1910.

Lloyd, C. G. Mycological notes 35: 461–476. Mr 1910. [Illust.]

Long, B. Range extension of *Scirpus Smithii,* var. *setosus.* Rhodora **12**: 155, 156. 14 Jl 1910.

Mackenzie, K. K. Notes on *Carex*—VI. Bull. Torrey Club **37**: 231–250. 2 Je 1910.

McGregor, E. A. Two new seed-plants from the Lake Tahoe region, California. Bull. Torrey Club **37**: 261–264. *f. 1, 2.* 2 Je 1910.
Apocynum bicolor and *Lappula Jessicae*, spp. nov.

Mell, C. D. The histology of resin canals in white fir. Am. Forestry **16**: 351–356. *f. 1–9.* Je 1910.

Meyer, R. Über *Echinopsis campylacantha* R. Mey. und *E. leucantha* Walp. Monats. Kakteenk. **20**: 73–76. 15 My 1910.

Murrill, W. A. The *Polyporaceae* of Jamaica. Mycologia **2**: 183–197. 15 Jl 1910.
13 species described as new.

Nash, G. V. A century plant coming into flower. Jour. N. Y. Bot. Gard. **11**: 123–125. *pl. 79.* My 1910.

Nash, G. V. *Tropaeolaceae.* N. Am. Flora **25**: 89–91. 3 Je 1910.

Newcombe, F. C. The place of plant responses in the categories of sensitive reactions. Am. Nat. **44**: 333–342. Je 1910.

Nichols, G. E. Notes on Connecticut mosses. Rhodora **12**: 146–154. 14 Jl 1910.

Osterhout, G. E. Colorado notes. Muhlenbergia **6**: 46, 47. *f.* 8. 12 My 1910.
Includes *Aulospermum Betheli* sp. nov. and new varieties, one each, in *Aster* and *Arnica.*

Pace, L. Some peculiar fern prothallia. Bot. Gaz. **50**: 49–58. *f. 1–11.* 14 Jl 1910.

Piper, C. V. Botany in its relations to agricultural advancement. Science II. **31**: 889–900. 10 Je 1910.

Prescott, A. Juvenile ferns. Fern Bull. **18**: 45–47. [My] 1910

Rock, J. F. Some new Hawaiian plants. Bull. Torrey Club **37**: 297–304 *f. 1–5.* 21 Jl 1910
New species, one each, in *Pittosporum, Sideroxylon, Lysimachia,* and *Dubautia.*

Rolfe, R. A. *Begonia Martiana*, var. *grandiflora.* Curt. Bot. Mag. IV. **6**: *pl. 8322.* Jl 1910.

Sargent, C. S. *Crataegus* in Pennsylvania—II. Proc. Acad. Nat. Sci. Philadelphia **62**: 150–253. Ap 1910.
Many new species described.

Saxton, W. T. Contributions to the life history of *Widdringtonia cupressoides.* Bot. Gaz. **50**: 31–48. *pl. 1–3*+*f. 1–3.* 14 Jl 1910.

Schatzberg, A. Preservation of wild flowers. Jour. N. Y. Bot. Gard. **11**: 117–123. My 1910.